

## SOME RESEARCHES IN THE FAR EASTERN SEASONAL CORRELATIONS.

55/501(520) (THIRD NOTE.)<sup>1</sup>

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[Abstract by the Editor from the Journal of the Royal Meteorological Society of Japan, June 1917, 36: 55-63.]

1. *Correlation between the April pressure in southeastern Canada and the August temperature in northern Japan.*—A remarkable parallelism is traced between the variation of the barometric pressure at Toronto in April and the variation of the temperature at Erimo in the following August. The April pressures for Toronto, 1887 to 1914, and the Erimo temperatures for August for the same interval, show that 21 out of 27 variations of the August temperatures at Erimo are in the same sense as those of the April barometric pressures at Toronto, while only 6 are of conflicting signs. Hence the probability that the signs will be similar is 78 per cent as against 22 per cent that they will be in opposition. It is concluded that a rise of pressure in southeastern Canada in April appears to be followed by a rise of temperature on the east coast of northern Japan in August, and vice versa.

The same data presented graphically, strikingly confirm the deduction; but when the correlation coefficient is deducted it appears that  $r = +0.32 \pm 0.114$ , a value that is unduly small. This is explained, perhaps, by the fact that the variation under consideration is superposed upon a secular variation. It is also here pointed out that a similar parallelism exists between the April pressures at Montreal and elsewhere in eastern Canada and the August temperature in northern Japan.

2. *Correlation between the April pressure in the Azores and the August temperature in northern Japan.*—Comparisons between the April pressure at Ponta Delgada, Azores, from 1879 to 1912, with temperatures in August at four stations in northern Japan for about the same period, show a fairly established parallelism. The probability of the variation of the August air temperature at the four localities in Japan, in the same sense as that of the April pressure at Ponta Delgada is shown in the following Table 1.

TABLE 1.—August temperature in northern Japan and April pressure at Ponta Delgada.

Sign.	Nemuro.	Erimo.	Miyako.	Isinomaki.
Cases with the same.....	24	19	21	18
Cases with the opposite.....	9	6	8	6
Number of cases.....	33	25	29	24
Probability of the same sign.....per cent...	76	76	72	75
Probability of the opposite sign.....do.....	24	24	28	25

The coordinates of three places are given in the MONTHLY WEATHER REVIEW, January, 1916, page 18, but Erimo lies in latitude  $42^{\circ}$  N., longitude  $143^{\circ} 15'$  E. Graphic construction confirms the parallelism generally, and it is concluded that a rise of pressure at Ponta Delgada in April is followed by a rise in temperature in northern Japan in the following August, and vice versa.

3. *Correlation between the April pressure in the Bermudas and the August temperature in northern Japan.*—Bermuda lies at the western extremity of the great Atlantic anticyclone, while the Azores lie at the opposite extremity. Any variation in intensity and position of the action-center is correspondingly revealed in the barometric data at either station. It is therefore no mere coincidence that one can trace a fairly established parallelism between the April pressure at Prospect,

Bermuda, and the temperature of the following August in northern Japan. The corresponding records from 1896 to 1914 (Table 2 on p. 58, loc. cit.) bring this out. The probability of the variation of the August temperature at the various localities in northern Japan in the same sense as that of the April pressure at Prospect, Bermuda, is shown in the following Table 2.

TABLE 2.—August temperature in northern Japan and April pressure at Prospect, Bermuda.

Sign.	Nemuro.	Erimo.	Miyako.	Isinomaki.
Cases with the same.....	13	12	12	12
Cases with the opposite.....	6	7	7	7
Number of cases.....	19	19	19	19
Probability of the same sign.....per cent...	68	63	63	63
Probability of the opposite sign.....do.....	32	37	37	37

4. *Correlation of the barometric pressures at Toronto in April and August.*—The correlation between eastern Canada and Japan, made above in paragraph 1, brought out a remarkable parallelism in the mean barometric pressures for Toronto in April and August during the years 1887-1914, inclusive.

5. *Correlation between the April pressure in Iceland and the temperature of the following August in northern Japan.*—Prof. von Hann has shown<sup>2</sup> that there exist remarkable contrasts between the pressure deviations at Ponta Delgada in the Azores and at Stykkisholm, Iceland. We have shown in the preceding paragraphs that there is parallelism between the April pressure at Ponta Delgada and the temperature of the following August at Nemuro, Hokkaido. It follows that there must be a marked contrast between the variations of the April pressure at Stykkisholm and the August temperature at Nemuro. This is clearly shown to exist by the data in Table 3 below. The pressure data for Stykkisholm have been taken from Dr. Lockyer's pressure table.<sup>3</sup> In the table  $s$  stands for the April pressure at Stykkisholm and  $\delta s$  for its inter-annual variation;  $w$  for the August temperature at Nemuro and  $\delta w$  for its inter-annual variation;  $p$  for the April pressure at Ponta Delgada.

TABLE 3.—Correlation between the April pressure at Stykkisholm, Iceland ( $s$ ), and the August temperature at Nemuro, Hokkaido ( $w$ ), through the April pressure at Ponta Delgada, Azores ( $p$ ).

Year.	$s$	$w$	$\delta s$	$\delta w$	$p$	$p-s$	$\delta(p-s)$
	mm.	°C.	mm.	mm.	mm.	mm.	mm.
1879.....	756.6	17.1	.....	.....	764.9	8.3	.....
1880.....	51.6	20.5	-5.0	+3.4	65.6	14.0	+5.7
1881.....	758.0	16.9	+6.4	-3.6	760.9	2.9	-11.1
1882.....	60.7	19.8	+2.7	+2.9	64.7	4.0	+1.1
1883.....	50.6	19.9	-10.1	+0.1	64.9	14.3	+10.3
1884.....	56.5	16.4	+5.9	-3.5	59.8	3.3	-11.0
1885.....	53.7	16.9	-2.8	+0.5	66.7	13.0	+9.7
1886.....	755.8	19.8	+2.1	+2.9	761.5	5.7	-7.3
1887.....	60.6	18.8	+4.8	-1.0	59.1	-1.5	-7.2
1888.....	61.0	17.4	+0.4	-1.4	66.2	5.2	+6.7
1889.....	54.6	18.2	-6.4	+0.8	68.9	14.3	+9.1
1890.....	52.5	19.3	-2.1	+1.1	67.5	15.0	+0.7
1891.....	758.9	17.1	+6.2	-2.2	762.4	3.5	-11.5
1892.....	37.2	17.3	-1.7	+0.2	64.1	6.9	+3.4
1893.....	54.8	17.3	-2.4	0.0	62.7	7.9	+1.0
1894.....	52.6	17.8	-2.2	+0.5	66.6	14.0	+6.1
1895.....	56.0	15.8	+3.4	-2.0	62.0	6.0	-8.0
1896.....	752.6	17.7	-3.4	+1.9	768.7	16.1	+10.1
1897.....	46.5	17.0	-6.1	-0.7	67.4	20.9	+4.8
1898.....	48.7	16.4	+2.2	-0.6	65.1	16.4	-4.5
1899.....	59.1	15.4	+10.4	-1.0	65.4	6.3	-10.1
1900.....	54.6	18.2	-4.5	+2.8	65.3	10.7	+4.4
1901.....	752.0	17.9	-2.6	-0.3	764.8	12.8	+2.1
1902.....	59.3	14.5	+7.3	-3.4	61.1	1.8	-11.0
1903.....	57.4	15.9	-1.9	+1.4	64.7	7.3	+5.5
1904.....	47.7	18.5	-9.7	+2.6	69.6	21.9	+14.6
1905.....	.....	.....	.....	.....	.....	.....	.....

<sup>2</sup> Hann, Julius von. Die Anomalien der Witterung auf Island, u. s. w. Sitzungsber. Kaiserl. Akad. d. Wissensch., mathem.-naturw. Kl., 1904, Bd. 113.

<sup>3</sup> Grt. Britain. Solar Physics Committee. Monthly mean values of barometric pressures for 73 selected stations over the earth's surface. . . . Compiled . . . under direction of Sir Norman Lockyer. London, 1908, v. 97, etc., p. 4.

<sup>1</sup> For the previous Notes see this REVIEW, January, 1916, 44: 17-21, and May, 1917, 45: 238-240.

From Table 3 we see that out of 25 cases in only 4 cases are  $\delta s$  and  $\delta w$  of the same sign (1882, 1886, 1897, 1901). Hence the probability of the contrary sense in the variations of the August temperature at Nemuro as compared with those of the April pressure at Stykkisholm is 84 per cent, and the probability of their having the same sign is 16 per cent. The author also presents this comparison in graphic form (his Fig. III).

5. *Correlation between the April barometric difference Azores-Iceland, and the August air temperature in northern Japan.*—Inspection of Table 3 shows further that there is a remarkable parallelism between the barometric difference or gradient between Azores and Iceland ( $p-s$ ) in April and the temperature at Nemuro for the following August. Out of the 25 cases given there are 21 in which the signs of  $\delta w$  and  $\delta(p-s)$  agree; hence the probability of parallelism is 84 per cent, and that of contrast is 16 per cent.—C. A., jr.

#### Kristian Birkeland, 1867-1917.

By C. CHREE.

[Reprinted from *Nature*, London, June 28, 1917, 99: 349.]

We regret to learn from the [London] Morning Post that Prof. Kristian Birkeland, of Christiania, died in Tokyo on June 18, 1917. He was one of the few speculative physicists of the day the value of whose work would be generally admitted in commercial circles. He was the co-inventor with Mr. Sam Eyde of the Birkeland-Eyde direct process for the manufacture of calcium nitrate by the extraction of nitrogen from the atmosphere. In the Journal of the Royal Society of Arts, May, 1912, Mr. E. Kilburn Scott records how, starting with a 25-horsepower experimental plant in 1903, the company controlling the Birkeland-Eyde patents had 200,000 horsepower at work in 1912, and was likely to add a further 300,000 horsepower before the end of 1916. This was by no means the only successful patent in which Prof. Birkeland was interested.

As a theorist Prof. Birkeland was extraordinarily bold in his speculations. He had theories on the internal constitution of the sun and the nature of sun spots; on the sun as a magnet and as a source of electricity;<sup>1</sup> on the origin of the planets and their satellites; on the nature of various celestial phenomena, specially the zodiacal light;<sup>2</sup> on the production of auroræ and magnetic storms;<sup>3</sup> and on the past geological history of the earth. The wealth acquired by his practical gifts enabled Prof. Birkeland to experiment and to arrange for solar and magnetic observations on a large scale. He made many striking experiments with an artificially magnetized terella in a high vacuum, directing toward it electrical discharges intended to represent the discharge of corpuscles from the sun.<sup>4</sup> In some of his experiments the vacuum chamber had a capacity of 70 liters and the supply of electrical energy required a 6-horsepower engine. He obtained phenomena closely resembling various forms of aurora, phenomena which he believed to represent the conditions under which magnetic storms appear on the earth.

Prof. Birkeland was largely responsible for the institution of special magnetic observatories in Arctic regions in 1900, in 1902-3, and again during the last few years. His two large volumes in English, "The Norwegian Aurora Polaris Expedition, 1902-3," besides much speculation as to the causes of magnetic storms, contain much important

information as to the simultaneous progress of magnetic disturbance at different parts of the earth.<sup>4</sup> Since 1910 he had lived a good deal abroad for observational purposes, and numerous communications to the Comptes Rendus of the French Academy of Sciences describe his various conclusions and speculations. In one communication dated July, 1914, he expressed his intention of devoting the next three years to the study of the zodiacal light in Natal, at Helwan, and in Uganda, and he was working in Egypt in 1915 and 1916. Presumably the continuation of his quest had taken him to the Far East. At the time of his death Prof. Birkeland was only about 50 years of age; but when last in England, in 1913, he had aged considerably in appearance and become very deaf. He was, however, as animated as ever when discussing his theories.

#### USE OF THE DIVINING ROD IN THE SEARCH FOR HIDDEN THINGS.

In the MONTHLY WEATHER REVIEW for March, 1900, the late Prof. Cleveland Abbe published a note drawing attention to the appointment of a French commission, presided over by the engineer Borthier de Rollière, to study all apparatus and methods employed by sorcerers, water seers, etc., who use the divining rod, exploring pendulum, hydroscopic compass, or other fancifully named device. The report of this commission was probably published in 1913, but seems not to have settled the question of the reliability of this kind of device, for it appears that many persons are still successfully persuading the public to employ it.

The literature on the subject of the divining rod is very extensive, and embraces works in one or the other of at least four modern or dead languages, beginning as early as 1532. This literature has recently been well searched and condensed into an interesting publication of the United States Geological Survey,<sup>1</sup> which may be recommended to all who ask, or have to answer, questions about the "discovery" of water, ores, minerals, etc., by occult means. The following is quoted from the introductory note by O. E. Meinzer:

The use of a forked twig, or so-called divining rod, in locating minerals, finding hidden treasure, or detecting criminals is a curious superstition that has been a subject of discussion since the middle of the sixteenth century and still has a strong hold on the popular mind, even in this country, as is shown by the large number of inquiries received each year by the United States Geological Survey as to its efficacy, especially for locating underground water, and the persistent demands that it be made a subject of investigation by the Survey. The bibliography shows that a truly astonishing number of books and pamphlets have been written on the subject. \* \* \* The outline of the history of the subject presented in the following pages will probably enable most honest inquirers to appreciate the practical uselessness of "water witching" and other applications of the divining rod, but those who wish to delve further into the mysteries of the subject are referred to the literature cited in the bibliography, in which they will find reports in painful detail of exhaustive investigations and pseudo-investigations of every phase of the subject and every imaginable explanation of the supposed phenomena.

It is doubtful whether so much investigation and discussion have been bestowed on any other subject with such absolute lack of positive results. It is difficult to see how, for practical purposes, the entire matter could be more thoroughly discredited, and it should be obvious to everyone that further tests by the United States Geological Survey of this so-called "witching" for water, oil, or other minerals would be a misuse of public funds.

A large number of more complicated devices for locating water or other minerals are closely related to the forked twig. A favorite trick for appealing to uneducated persons and yet making specific disproof

<sup>1</sup> This REVIEW, April, 1914, 42: 209 (Abstract).

<sup>2</sup> This REVIEW, April, 1914, 42: 211 (Quoted); see also footnote 3.

<sup>3</sup> Abstract of conclusions in this REVIEW, September, 1916, 44: 508.

<sup>4</sup> This REVIEW, January, 1909, 37: 18-18.

<sup>1</sup> Ellis, Arthur J. The divining rod, a history of water witching, with a bibliography (and introduction by O. E. Meinzer). Washington, 1917. 69 p. 4 figs. 8". (U. S. Geol. Surv. Water Supply Paper 416).